FILE NO. 3-1561

AIRCRAFT ACCIDENT REPORT

SKYWAYS INTERNATIONAL, INC.

DOUGLAS DC-7C, N296

NEAR THE MIAMI INTERNATIONAL AIRPORT

DADE COUNTY, FLORIDA

JUNE 21, 1973

ADOPTED: FEBRUARY 27, 1974

NATIONAL TRANSPORTATION SAFETY BOARD
Washington, O.C. 20591
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No aviation safety recommendations are contained in this report.

16. Abstract

A Skyways International, Inc., Douglas DC-7C crashed into the Everglades, 8.9 nautical miles northwest of the Miami International Airport, on June 21, 1973. The accident occurred at 0426 e.d.t., about 6 minutes after the aircraft took off from runway 27L on the Miami International Airport. Before the aircraft crashed, fire damaged the left wing and the No. 1 engine. The aircraft was destroyed on impact. Three crewmembers, the only persons on board, were killed.

The accident occurred during the hours of darkness and extremely heavy rain, wind, and lightning. There were no eyewitnesses.

The National Transportation Safety Board determines that the probable cause of the accident was the loss of aircraft control, due either to turbulence or an in-flight fire, or both. Inability of the crew to establish timely radio communications with the departure controller was also a factor, because it delayed compliance with thunderstorm avoidance vectors.

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SYNOPSIS

A Skyways International, Inc., Douglas DC-7C crashed into the Everglades, 8.9 nautical miles northwest of the Miami International Airport, on June 21, 1973. The accident occurred at 0426 e.d.t., about 6 minutes after the aircraft took off from runway 27L on the Miami International Airport. Before the aircraft crashed, fire damaged the left wing and the No. 1 engine. The aircraft was destroyed on impact. Three crewmembers, the only persons on board, were killed:

The accident occurred during the hours of darkness and extremely heavy rain, wind, and lightning. There were no eyewitnesses.

The National Transportation Safety Board determines that the probable cause of the accident was the loss of aircraft control, due either to turbulence or an in-flight fire, or both. Inability of the crew to establish timely radio communications with the departure controller was a factor, because it delayed compliance with thunderstorm avoidance vectors.

1. INVESTIGATION

1.1 History of the Flight

On June 21, 1973, Skyways International, Inc., Douglas DC-7C, N296, was operated by Warnaco, Inc., as an international cargo flight from Miami, Florida, to La Romano, Dominican Republic. The crew consisted of a pilot, a copilot, and a flight engineer.

At 0404:40 1/, the copilot contacted the Miami Air Route Traffic Control Center (MIA ARTCC) clearance delivery controller. At 0405:35, the copilot contacted the MIA local controller and requested clearance to taxi to the active runway. The controller advised N296 that the surface wind was 250° to 280° at 8 to 10 knots and cleared the flight to taxi to runway 9L. The crew expressed a preference for runway 9R, since

1/ All times in this report are eastern daylight, based on the 24-hour clock;

the aircraft was parked on the military ramp 2/. They accepted runway 9L when the local controller advised them that because of noise abatement restrictions, runway 9R was not available. Two minutes later, while the aircraft was taxiing, the tower changed the active runways to 27L and 27R because of a wind shift. The controller then issued a clearance to N296 to taxi to runway 27L.

Before the change in active runway, the local controller had discussed the surface wind conditions and thunderstorm activity to the west of the airport with the crew of a departing Braniff flight who were tuned to the local control frequency. After coordinating with the departure controller, the local controller issued a clearance to the Braniff crew for a right turn to 040° after takeoff to keep the aircraft clear of the adverse weather to the west.

An Eastern training flight (T-168), which arrived at the Miami airport about 5 minutes before the departure of N296, had also discussed the weather conditions with the local controller on 118.3 MHz, the local control frequency.

The controller had not discussed the weather to the west with N296 before its departure, nor with a scheduled Eastern Air Lines flight that had departed runway 27R about 7 minutes earlier.

At 0411:25, N296 was issued a clearance as follows: "N296 cleared as filed, maintain five thousand, fly heading two seven zero for radar vectors to Bimini, departure control one two five point zero, squawk zero seven zero zero, expect eleven thousand ten minutes after departure."

At 0420:18, the copilot of N296 received the takeoff clearance issued by the local controller and responded by saying, "Rolling." The flight was then cleared to contact the MIA departure control on 125.0 MHz. The copilot called departure control at 0422:40; the departure controller replied, "Douglas two nine six, Miami departure is radar contact, turn left, heading one one zero." During the next 30 seconds, the flight called departure control twice; each time the controller replied by repeating the left turn clearance. At 0423:10, N296 again contacted the local controller and reported that it could not reach the departure controller on 125.0 MHz. The local controller then assigned N296 a different frequency, 125.75 MHz, on which to contact the departure controller. N296 contacted the departure controller at 0423:40.

At 0424, the departure controller again cleared N296 for a left turn, this time to a heading of 100°, and asked the crew to report the aircraft's altitude. The crew acknowledged the left turn and reported, ". . . at a thousand feet."

2/ Aircraft parking area in the southwest quadrant of Miami International Airport.

At 0425, the departure controller called, ". . . two nine six, that was a heading of one zero zero, I see you're turning northwest bound, the, . . . turn left, turn left heading one two zero, one two zero, please sir." When N296 did not reply, the departure controller again called, "Douglas two nine six, Douglas two nine six." N296 acknowledged this call, and the controller stated, "OK, that's the weather's (sic) is right up ahead of you there is, . . . heavy." The copilot, keying the microphone twice, replied, "Ok, . . . standby here."

Immediately after the copilot's reply, the departure controller transmitted, "You want to keep it coming, . . . you want to keep it coming, right turn, or have you started a left turn now?" N296 did not acknowledge that transmission; there were no further communications with the flight.

From 0425:15 through 0425:25, the controllers had discussed N296. They noted that the aircraft was ". . . stumbling all over the sky," and remarked, "He's supposed to make a left turn, he made a right turn." The departure controller concluded the discussion by saying, "I think we're going to go north with him, so protect him."

Later the departure controller stated that he had observed N296's radar target turn right through north for two sweeps (8 seconds) of the radar antenna, and then start to turn left through a heading of about 230°. The left turn continued during 3 or 4 sweeps (12 to 16 seconds) of the radar antenna, after which the target disappeared from the radarscope; the time was approximately 0426.

The aircraft struck the ground in a 70° nosedown and 70° left wingdown attitude, on a 30° heading. The aircraft crashed in an uninhabited area of the Everglades, 8.9 nautical miles on a magnetic bearing of 295° from the departure end of runway 27L, and 3 nautical miles north of the extended runway centerline.

The accident occurred during the hours of darkness. Although no one witnessed the crash, persons who, at the time of the crash, were driving on a nearby highway or who lived in the nearby area, described the extremely heavy rain, wind, and lightning as the most severe weather they could recall.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Others
Fatal	3	0	0
Nonfatal	0	0	0
None	0	0	

1-C

1.3 Damage to Aircraft

The aircraft was destroyed by impact and fire.

1.4 Other Damage

None

1.5 Crew Information

The crewmembers were certificated according to regulations in 14 CFR, Parts 61 and 91. (See Appendix B.)

The copilot had been a member of another flightcrew that had arrived at the Miami International Airport at 2330 on June 20, 1973, after a round trip flight to San Juan, Puerto Rico, which lasted 19 hours, including 7 hours on the ground at San Juan. The copilot reported for duty as second-in-command on N296 at 0315 on June 21, 1973.

1.6 Aircraft Information

Current records of the maintenance, condition, and loading of the aircraft, which were reported to be on board, were not recovered. Part 91 of 14 CFR does not require that the owner or operator maintain records other than those kept in the aircraft.

Records that were kept by Airlift International, Inc., the previous Owner of the aircraft, indicate that the aircraft was certificated according to regulations. The aircraft had been flown about 216 hours since its purchase by Skyways International, Inc., on July 31, 1972. There was no evidence to indicate that it had not been maintained in an airworthy condition.

No record of the weight of the cargo or of how it was loaded was filed at the flight's origination point; 14CFR 91 does not require such a record.

Detailed information on the aircraft, its cargo, and its leasing arrangement is contained in Appendix C.

1.7 Meteorological Information

1.7.1 Weather Briefing

About 0302 on June 21, the captain telephoned the Miami Flight Service Station and requested a weather briefing for the route to Santo Domingo and terminal forecasts for Santo Domingo and San Juan. The briefing he received contained the following information: . . . two to three

thousand scattered, eight to twelve thousand scattered, there is widely scattered thunderstorms and some rainshowers probably scattered all the way down Amber Sixteen to Santo Domingo. I think otherwise some of the tops running around eight thousand ...."

1.7.2 Synoptic Situation

The 0200 and 0500 surface weather charts showed no fronts over Florida.

1.7.3 Surface Weather Observations

Surface weather observations for Miami International Airport showed that thunderstorms began at 0312 and continued until 0553, and that 0.15 inch of rain was recorded from 0400 to 0500. At 0420, the surface wind velocity was about 5 knots. Selected portions of the surface weather observations, for the locations and times indicated, were as follows:

Miami International Airport

0350 - 1,100 feet scattered, measured ceiling 1,500 feet broken, 25,000 feet overcast, visibility-4 miles, thunderstorm, light rain showers, temperature-81° F., dew point-77' F., wind-090° 11 knots, altimeter setting-30.07 inches, thunderstorm began at 0312, thunderstorm west moving slowly northwest, frequent lightning in clouds, occasional lightning distant all quadrants, peak wind 090° 14 knots at 0348, rain began at 0344, visibility occasionally lower in thunderstorms, moderate rain showers.

0444 - Local, 1,000 feet scattered, measured ceiling 1,700 feet broken, 23,000 feet overcast, visibility-8 miles, thunderstorm, wind-170' 9 knots, altimeter setting-30.09 inches, thunderstorm west, no movement, occasionallightning all quadrants (tower request).

Tamiami Airport

0353 - Record Special, estimated ceiling 1,000 feet overcast, visibility-1 1/2 miles, thunderstorm, heavy rain showers, temperature-71° F., dew point-71° F., wind-2300 12 knots, altimeter setting-30.08 inches, thunderstorm overhead, movement unknown, frequent lightning in clouds all quadrants.

0407 - Special, indefinite ceiling 200 feet obscured, visibility-112 mile, thunderstorm, heavy rain showers,

wind 180° 40 knots, peak gusts 60 knots, altimeter setting-30.08 inches, thunderstorm overhead, movement unknown, lightning cloud to ground, frequent lightning in clouds all quadrants.

0426 - Special, estimated ceiling 1,000 feet overcast, visibility-3 miles, thunderstorm, moderate rain showers, wind-230° 10 knots, altimeter setting-30.08 inches, occasional lightning in clouds all quadrants.

0454 - Record Special, estimated ceiling 3,000 feet overcast, visibility-8 miles, thunderstorm, temperature-72° F., dew point-72' F., wind-230' 3 knots, altimeter setting-30.08 inches, rain ended at 0442, thunderstorm moved northwest, occasional lightning in clouds, lightning cloud to ground northwest.

Dade-Collier Airport

0350 - Record Special, estimated ceiling 800 feet overcast, visibility-3/4 mile, thunderstorm, moderate rain showers, temperature-69° F., wind-180' 20 knots, altimeter setting, estimated-30.08 inches, thunderstorm overhead moving northwest.

0415 - Special, estimated ceiling 800 feet overcast, visibility-3 miles, thunderstorm, moderate rain showers, wind-180' 12 knots, altimeter setting, estimated-30.10 inches, thunderstorm moved northwest.

0452 - Estimated ceiling 800 feet overcast, visibility-3 miles, moderate rain showers, temperature-69' F., wind-180' 6 knots, altimeter setting, estimated-30.10 inches, thunderstorm ended at 0438.

1.7.4 Pilot Weather Reports

No pertinent in-flight weather reports were received.

Regarding the weather conditions he observed on his return to Miami, the supervisory pilot aboard Eastern Air Lines Flight T-168 stated:

"We (T-168) were still approximately 15 miles NW of the training airport ?/ and requested a clearance from MIA ATC to return to MIA, and were cleared direct to the MIA VORTAC. Approaching MIA VORTAC we observed on our radar what appeared to be a heavy line of unbroken

?/ Dade - Collier Airport

thunderstorms, with heavy cells, lying in a NE-SW line beginning at the VORTAC and extending to the western edge of the MIA airport. We descended to 2,000 feet hoping to be able to get below the weather, but were unable. This line extended to the NE offshore and to the SW and then W for some 50 to 60 miles. Not wanting to penetrate this heavy weather, and with excellent cooperation from MIA Approach Control, we reversed course and then spotted a break in the weather just SW of the FLL 4/ Airport."

1.7 '.5 Radar Weather Observations

The Miami 0430 radar weather observation was as follows:

> Area of echoes, two-tenths of the area covered by very strong echoes containing thunderstorms producing very heavy rain showers, four-tenths of the area covered by weak echoes containing light rain, no change in intensity since the last observation, area bounded by 352° (true) - 170 miles (nautical), 029° - 160 miles, 152° - 200 miles, 236° - 145 miles, 309° - 170 miles, 326° - 60 miles, movement of cells from 140° 14 knots, maximum top of detectable moisture 50,000 feet m.s.l. at 291° 49 miles, tropopause at 47,000 feet m.s.l.

The radarscope overlay that was prepared at 0440 in conjunction with the radar weather observation above showed a broad, solid area of echoes extending westward from Miami International Airport to the Gulf of Mexico. The radar antenna is located at Coral Gables, approximately 5 miles south of Miami International Airport (lat. 25°43' N. and long. 80°17' W.).

Radarscope pictures taken at 0411, 0426, and 0441 showed that the same area of echo coverage was as solid as that depicted on the overlay.

1.7.6 Upper Air Observations

Miami 0800 Winds Aloft Observation

	Direction (true)	Velocity (knots)
1,000	285°	2
2,000	235°	6
3,000	195°	11
4,000	140°	16
5,000	140°	14
6,000	185°	12

4/ Fort Lauderdale - Hollywood International Airport

The Miami 0800 radiosonde ascent (upper air observations) showed intermittent layers of stable and conditionally unstable air to approximately 6,000 feet, m.s.l., except for a shallow layer of absolutely unstable air near 1,000 feet m.s.l., and generally moist air. The freezing level was 13,700 feet m.s.l.

1.7.7 National Weather Service Forecasts

The aviation terminal forecast issued by the Forecast Office in Miami at *0040*, valid for Miami from 0100 on June 21 to 0100 on June 22, was as follows:

> 2,000 feet scattered, 10,000 feet scattered, ceiling 25,000 feet broken, scattered clouds variable to broken, chance ceiling 800 feet broken, visibility-2 miles, thunderstorm, moderate rainshowers.

The aviation area forecast issued by the Forecast Office in Miami at 2352 on June 20, valid 0200-1400, read, in part, as follows:

> Atlantic and Caribbean. West of 72° west, from 12° north to 41° north, Gulf of Mexico north of 23° north, and Florida.
>
> Synopsis. Stationary front over Texas coastal waters. Diffuse stationary front east-west along 35° north over Atlantic waters.
>
> Significant Weather. Over the Gulf coastal waters and adjacent coastal sections from Texas eastward into the Atlantic coastal waters south of 37° north, including the western Bahamas and Florida Straits 2,000 to 3,000 feet scattered, occasionally broken, widely scattered, locally scattered rain showers and thunderstorms, becoming generally scattered by late forenoon. Heavy thunderstorms will locally lower ceilings and visibility below 1,000 feet and 2 miles.
>
> Ice. Moderate to severe in clouds above freezing level 12,000 to 16,000 feet.
>
> Turbulence. Moderate to severe near rain showers and thunderstorms.

1.7.8 Observations of Weather by Local Resident

A local resident, located about 5 miles south of the accident site, stated that he was awakened between 0415 and 0425 on June 21, when the telephone connected with the horn on his wrecker truck sounded the horn. The horn sounded until he went outside and shut it off. He stated that a tremendous rain, wind, and lightning storm was in progress and that there was much thunder. He further stated that the lightning, which was north of his location, was almost continuous.

1.7.9 Lightning-Strike Record

A lightning-strike record was obtained from Electrofields, Inc. The sensor, located within 10 miles of the accident site, detected and recorded lightning strikes in the Miami area on June 21, from 0420 to 0427.

1.8 Aids to Navigation

Not applicable.

1.9 Comnications

The copilot's attempts to establish radio communications with the departure controller on 125.0 MHz were recorded on the MIA-ARTCC tape. He succeeded in making satisfactory 2-way radio contact only after he was assigned a different frequency. Other aircraft had no difficulty in maintaining 2-way radio communications with the departure controller on 125.0 MHz, either before or after N296 failed to make contact on that frequency.

1.10 Aerodrome and Ground Facilities

Not applicable.

1.11 Flight Data and Cockpit Voice Recorders

A cockpit voice recorder was not installed. Part 91 of 14 CFR does not require a voice recorder if the operator of the aircraft does not hold a commercial operator's certificate.

A flight data recorder was not required for this type of aircraft.

1.12 Aircraft Wreckage

1.12.1 Description of Accident Site,

The accident site in the Everglades was in flat marshland which was covered by saw grass, 3 to 8 feet tall. The water table in the area at the time of the accident was about 1 inch below ground level. Later, during attempts to recover the wreckage, the water table reached 8 to 10 inches above ground level. This situation imposed severe limitations on the amount of submerged aircraft structure that could be recovered from the craters.

The area of impact consisted of one large crater, two medium-size craters, and numerous small craters. The first persons to reach the scene found the craters filled with water. Numerous pieces of wreckage, two engines, one engine supercharger and accessory section, one engine power section, two propeller assemblies, both main landing gears, and

the nose were found on the surface in a fan-shaped pattern which arced left and toward 120° magnetic. (See Appendix D.) The large crater showed the approximate outline of the front profile of the left wing, two engines, and the fuselage -- all oriented on a heading of 030° magnetic. Soil was displaced in large quantities to the left and right of the craters. The saw grass in and around the area was not burnt. The aircraft's cargo was scattered throughout the area of impact. Cloth material, which was a part of the cargo, was neither scorched nor burnt. Ground fire was evident in a few isolated spots near the craters.

The wreckage was scattered over an area approximately 1,200 feet long and 600 feet wide. Wreckage emanated from the west side of the large crater where components of the left aileron and left outboard wing lay.

No complete circumferential cross section of the main aircraft fuselage remained. The major portion of the airframe forward of fuselage station 978 and the wing structure were demolished. All structural separations resulted from impact; there was no evidence of malfunction or failure of the primary structure or of the flight control surfaces in flight.

The right main landing gear remained up and locked. The left main landing gear, the nose landing gear, and portions of their attach structure were separated from the airplane and substantially damaged.

1.12.2 Systems

The flight control system, hydraulic system, electrical system, and most of the cockpit instruments were fragmented by impact. The instruments and communication components that were recovered were examined for any information they might contain. None were damaged by fire.

Both Sperry, Model HZ-1, Horizon Flight Director Indicators were recovered. One indicator, serial No. 307, was disassembled and found to have a pitch indication of 80° nosedown and a bank indication of 70° to 80° left wing down. The other indicator, serial No. **113,** was found with the pitch-angle mechanism disengaged and damaged; the front portion was recovered with its inner gear drive ring firmly positioned in a bank indication of approximately 70° left wing down.

The other components recovered were so heavily damaged that their indications could not be related to heading, power settings, or to other selections that might have helped to determine the crew's actions or other circumstances preceding the crash. The aircraft was equipped with airborne radar.

1.12.3 Powerplants

The No. 1 engine power section and the supercharger and accessory section separated at the front crankcase main section mounting flange. Both sections were found buried near each other in mud. Only a portion of the supercharger's front housing was exposed. The Nos. 1, 2, 13, 14, 15, 16, 17, and 18 cylinders separated from the power section. Only the Nos. 1, 15, and 17 cylinders and the No. 13 cylinder head were located.

The No. 1 engine supercharger and accessory sectionwas disassembled. No preexisting operational malfunction was evident. Several hoses near the fuel pump were burnt and scorched. Fire also damaged the starter and generator leads and the supercharger drive. All of the gear teeth in the power recovery turbine (PRT) drive gear were sheared. The accessory drive gears were intact and undamaged. The fuel pump (P/N Pesco 2P-771-A) remained attached to the accessory drive gearbox. Approximately a 1/2-inch-wide section of the gasket (Pesco P/N TF-160; WAS 11334) which was installed between the pump body (Pesco P/N 771-6) and the cover (Pesco P/N 771-20), was blown out. The machined surface of the cover showed a fuel stain as wide as the blown-out section of gasket. The pump body contained a crack, about 1/16-inch wide, 180° opposite the blown-out section of gasket. The crack extended to the gasket surface of the pump.

Some of the spark plugs, which remained intact during the crash, were removed from the four engine power sectionsand examined. No evidence of erosion, electrode fouling, peening, or operation at excessive temperatures was detected. In addition, there was no evidence that any internal part had failed before impact. All exposed pistons and their valves were examined by borescope; these parts showed no evidence of detonation or burning. No valve contact or strike marks were visible on the piston heads.

The Nos. 1, 3, and 4 main oil pressure and scavenge pumps, the main oil screens, and the engine fuel injection master control filters were intact, properly secured, and undamaged. The filters and screens were free of metallic debris and contamination (the filters and screens of the Np. 2 engine were not recovered). The pump drive gears rotated freely and did not indicate any distress. The propeller governors for the four engines were not recovered.

The No. 2 engine power section and supercharger and accessory drive section separated from the engine at the front crankcase main section mounting flange. The Nos. 1, 2, 13, 14, 15, 16, 17, and 18 cylinders separated from the power section. Only the No. 14 cylinder was located.

The fuel pump had broken from its flange, but remained attached to the flex hoses. The flex line to the master control contained a small charred area about 10 inches from the inlet to the master control. This

small area was the only evidence of fire in the rear accessory section and supercharger area.

The Nos. 3 and *4* engines remained relatively intact. The Nos. *12*, 13, *14*, **15**, 16, **17**, and 18 cylinders from the No. *3* engine separated from the power section. Only the **Nos.** 13 and 18 cylinders were located. The Nos. *4*, 6, *12*, 13, 14, 15, and 16 cylinders separated from the No. 4 engine. Only the **Nos.** 6, 13, 15, and 16 cylinders were recovered. The No. 3 engine's fuel pump was still attached; however, the body of the fuel pump had broken open at the inlet line fitting. The fuel inlet line was charred. The fuel pump of the **No.** 4 engine remained intact and attached. A fuel **pump** flex hose and some of the fuel lines attached to the master fuel injection control were charred.

Except for the blown gasket in the **No.** 1 engine fuel pump, there was no evidence of any defects in the engines before the accident.

One unidentified upper nacelle section, minus the airscoop cowling, was found in the main wreckage area. It showed no evidence of fire damage. Two airscoops and several unidentified sections of cowling were also found in the main wreckage area; these, too, were undamaged by fire. The No. 1 engine rear accessory section cowling, engine mount tubes, nacelle structure, and rear firewall were not found.

1.12.4 Propellers

All four propeller assemblies separated from their respective powerplants. The **No.** 1 propeller was not recovered. The other three were not damaged by fire.

Because each propeller's dome assembly had been cocked inside its respective outboard barrel halves, each dome had to be removed by cutting the outboard barrel half with a cutting torch.

The individual blade fractures were primarily oriented rearward from the thrust face toward the camber face of each blade. The positional direction of the fractures was between 35° and 40°, referenced to the blade shank angular markings.

After the three propeller dome assemblies were removed, the propellers were disassembled to obtain the propeller blade spider shim plates. The shim plates which were broken into random-sized pieces were pieced together to determine propeller blade angle at impact.

The reverse and feather stop rings of each of the recovered propellers were found positioned at -14° and +94°, respectively. The low pitch stop ring position could not be determined, because of impact damage to the dome assemblies of each propeller.

Blade spider shim plate angular position readings, in degrees, were recorded for each of the recovered propellers as follows: (Several shim plate readings that could not be determined are designated by "N/A.")

Propeller	Blade No. 1	Blade No. 2	Blade No. 3	Blade No. 4
2	34	35	35	38
3	40	40	N/A	N/A
4	38	38	N/A	N/A

1.13 Medical and Pathological Information

Autopsies and toxicological examinations performed on the crewmembers revealed no evidence of disease or other medical condition that could have had a bearing on the accident.

1.14 Fire

The No. 1 fuel tank structure which contained the rear access door was covered with soot and charred on the inner surface and surrounding areas. The door nut-strip sealing ring was severely charred. The stringer, to which the wing skin containing the access door was attached, was found twisted and partially separated from the wing skin structure. The metal surface of the stringer and wing skin juncture, as well as the heavy rivets that connect the two components, was clean and undamaged by the fire. The inboard portion of the access door and the door mounting plate were fractured and buckled in an upward direction. However, the wing skin exposed by this fracture and the fracture surfaces were clean and undamaged by the fire.

Several segments of the left wing integral fuel tank baffling structure, from which mounting brackets and other structural pieces had been torn away, were covered with soot and damaged by heat. The area under the brackets was clean and undamaged by the fire. Several light metal parts from the left wing leading edge structure were covered with soot.

The center wing (No. 2) alternate fuel tank was charred and covered with soot. The inner surfaces of the tank were severely charred, and the collapsible fuel cell was consumed by fire.

The leading edge structure, tank baffling material, and accessory section of the No. 1 engine were found in the water-filled impact craters. Burnt left wing outboard skin structure and center wing structure found near these craters were lying in saw grass and vegetation that were not burnt,

Although small ground fires flared up close to the main crater, left main landing gear, and right-wing alternate (No. 3) fuel tank, they did not ignite the fuel-soaked saw grass and vegetation in the area.

1.15 Survival Aspects

This was not a survivable accident.

1.16 Test and Research

A 1-gallon sample of fuel was taken from the truck which had been used to refuel N296 and tested in the Pan American World Airways Fuel Laboratory. Test indicated that the fuel met the specifications of ASTM D-910 for 115/145 grade fuel.

A fuel pump of the same make and model as the No. 1 engine fuel pump was modified to simulate the physical condition of the section of the gasket that had blown out.

The modified pump was installed on a fuel flow test bench, and a pump inlet pressure of 20 pounds per square inch gage (lb/in^2g) was applied while the speed of the pump was varied to represent different engine speeds (r/min). The ensuing leakage rates of the pump were measured with the following results:

Pump Speed (r/min)	Fuel Flow (lb/h)	Discharge (lb/in^2g)	Leak Rate (cm^3/min)
750	1900	7	1840
2000	4080	11	2320
2500	4060	11	2240

2. ANALYSIS AND CONCLUSIONS

2.1 Analysis

The crewmembers were certificated and qualified for the operation according to 14 CFR 91. There was no evidence of any medical condition that would have affected the performance of their duties.

The copilot was the only crewmember who failed to get adequate rest during the previous 24 hours. Although he, allegedly, slept in the unairconditioned aircraft during the 7 hours it was being unloaded and reloaded in San Juan, the copilot had been virtually on duty from 0715 to 2330 on June 20. He had accumulated only about 3 hours 45 minutes of rest time and a reported 2 hours 15 minutes of sleep before N296 departed the next day. There is no indication that any crewmember reacted incorrectly or improperly during the events leading to the accident. However, because of fatigue, the copilot would have been prone to make errors of omission or commission.

The actual weight and distribution of the cargo was not determined. Although the aircraft's gross weight at takeoff was within prescribed limits, it could not be determined whether the maximum zero fuel weight was within limits.

The Nos. 2, 3, and 4 engines and propellers showed evidence of high power at impact. Although the power setting of the missing No. 1 propeller could not be determined, the No. 1 engine showed evidence that it, too, was operating at impact.

When the copilot contacted the local controller for taxi clearance, the normal flow of traffic was toward the east. If this condition had continued, N296 would have departed from runway 9L on a course that would have taken the aircraft away from the thunderstorm activity. But shortly after the flight received clearance to taxi, the surface wind conditions became such that the traffic flow was changed to the west.

The local controller was aware of the thunderstorm activity to the west of the Miami airport, because he remarked about it to a Braniff jet about 4 minutes before N296 called for taxi clearance.

Whether the crew of N296 heard the discussion on the local control frequency between the controller and the departing Braniff flight could not be determined. N296 was, however, tuned to the frequency used by the local controller to discuss the weather later with an Eastern Air Lines training flight. The Safety Board believes that the thunderstorms existing west of the airport should have been obvious to the crew of N296. The crew would have discussed the most desirable course of action with the controller, had it been concerned about weather conditions. Also, the thunderstorm activity was not close enough to the Miami airport to prevent a departing aircraft from circumnavigating the storm cells and proceeding on course.

The crew's inability to establish 2-way radio communications with departure control on the assigned frequency immediately after takeoff caused the crew to be unaware--for about 3 minutes--of the departure vector that would have changed the flightpath away from the line of thunderstorms. In the time it took the crew to switch frequencies and to establish contact, the aircraft could have proceeded 3 or 4 miles closer to the thunderstorm. Why the aircraft turned to the right during this time, as the controller observed, could not be determined.

When radio contact was finally established, the controller reissued the clearance for a left turn to 100°, which the flight acknowledged. However, when the controller noticed that the aircraft continued to turn to the right, he repeated the clearance for a left turn to 100°, and then issued a clearance for a left turn to 120°. When he received no

response from N296, the controller advised the flight of the heavy weather ahead. The flight then requested the controller to "stand by."

In the meantime, the handoff controller was coordinating with the local controller to assure that no other departure clearance from runway 27R would conflict with N296, if it were allowed to continue the right turn. The departure controller gave the flight the option of continuing its right turn; but there was no response.

Failure of N296 to respond or to react to the clearances might have been because of receiver problems on the 125.0 MHz frequency, preoccupation by the crew with some in-flight emergency, or simply a discussion by the crewmembers of clearances they had received.

Without flight data recorder and cockpit voice recorder information, it is impossible to reconstruct accurately the aircraft's flightpath or to explain adequately what contributed to, or precipitated, the accident sequence. Some conclusions, however, may be drawn from recorded air traffic control communications and controllers' recollections. The first indication that control of the aircraft had been lost was the observation made by the controller that the aircraft was . . . stumbling all over the sky." Fifteen seconds later, the departure controller gave the crew the choice of either continuing the turn to the right or turning to the left. He then observed the target associated with N296 turn right through north during two sweeps of the radar antenna, and left through a heading of about 230° during 3 or 4 antenna sweeps, after which the target disappeared. In the area involved, the target is usually not shown on the radarscope when the aircraft's altitude is 500 feet or lower.

Since N296 struck the ground on a 30° heading, the steep, left descending turn from 230° must have occurred at an extremely high rate, typical of a spiral-type maneuver. The controller's observations suggest that this spiraling turn had already developed when the aircraft's radar return disappeared from the scope. The 90° difference between impact heading and wreckage scatter is another indication that the aircraft wax out of control. Therefore, the loss of control of the aircraft was the final event in a series of events, the sequence of which cannot be determined. Four possible explanations for the loss of aircraft control were considered: (1) In-flight fire, (2) turbulence upset, (3) lightning strike, or (4) loss of instrument indications.

(1) In-flight Fire:

Although most of the charring of fuel lines and other components of the Nos. 2, 3, and 4 engines is attributed to the post-crash fire, the greater intensity of the fire damage in the mud-covered areas of the No. 1 engine suggests an in-flight fire in that engine. The damaged gasket in the No. 1 engine fuel pump supports this probability.

The fire damage found in left wing components submerged in mud and water indicates that a fire broke out in that area of the wing while the aircraft was in flight. Despite extensive efforts with earth-moving equipment, enough of the left wing structure could not be recovered from the main craters to determine the origin and the progress of the in-flight fire or the extent of resulting structural. damage. Thus, the effect of the wing fire on aircraft controllability could not be assessed.

The crew's preoccupation with an in-flight fire might have been a reason for the silence after the radio calls and the departure clearances. The preoccupation with the fire and its effect on aircraft controllability could have contributed to the loss of control.

(2) Turbulence Upset:

In addition to an in-flight fire, the aircraft might also have been upset if it had encountered thunderstorm turbulence. The aircraft flew close to, if not actually into, the thunderstorm activity west of the airport. The echo intensity of the storm, as depicted on the radarscope at 0426, was classified in the radar weather observations as "strong." The thunderstorm had the potential of producing severe turbulence and strong updrafts and downdrafts. If severe turbulence was encountered, the aircraft could have been upset as the crew was turning it to detour the storm. The aircraft was probably flying at a relatively low altitude when it reached the heavy rainfall normally associated with downdrafts. To maintain that altitude would have affected airspeed and, thereby, controllability. The Safety Board believes that an encounter with turbulence could have played a significant part in the loss of control of N296.

(3) Lightning Strike:

The probability of lightning strikes occurring and momentarily blinding the crew was also considered. However, the setting of the cockpit lights, which would have been a factor in the effect of a lightning flash on the crew, could not be determined. A lightning strike also might have ignited the in-flight fire; but there is no evidence to support this theory.

(4) Loss of Instrument Indications:

Finally, loss of instrument indications in flight was considered as a possible cause of the aircraft loss of control. The pitch and bank indications found on the horizon flight directors coincided with the impact attitude of the aircraft. Therefore, the attitude instruments must have been operating properly at the time of impact.

2.2 Conclusions

(a) Findings

1. The flightcrew met the qualification requirements for operation under 14 CFR 91.

2. The copilot had insufficient rest between a flight on June 20, 1973, and the flight on June 21, 1973. There are no crew-rest requirements in 14 CFR 91.

3. The weight and loading of the aircraft could not be determined. The only copy of the weight manifest and center-of-gravity calculation was lost in the crash. Part 91 of 14 CFR does not require that a copy of the weight and balance calculation be filed anywhere outside the aircraft.

4. The airworthiness and maintenance condition of the aircraft could not be determined. All records kept during the 76 days preceding the accident were carried on board the aircraft and were lost in the crash. Part 91 of 14 CFR does not require records other than those maintained on the flight .deck.

5. Strong thunderstorm activity existed west of the Miami International Airport at the time N296 took off.

6. The flight was unable to establish 2-way radio contact with the departure controller on the frequency assigned after takeoff.

7. Radio contact with the departure controller was made on a different frequency about 3 1/2 minutes after takeoff. By that time, the aircraft had probably penetrated the edge of the thunderstorm where turbulence and downdrafts existed.

8. Had the flight been able to comply with the departure controller's vectors when he first issued them, an encounter with thunderstorm turbulence would have been iess severe or might have been avoided.

9. Air Traffic Control handled the flight according to established procedures. ATC did not compromise the safety of the flight, nor contribute to the accident.

10. There was an in-flight fire in the left wing which could have distracted the crew and affected aircraft control.

11. The aircraft was out of control when it struck the ground.

(b) Probable Cause

The National Transportation Safety Board determines that the probable cause of the accident was the loss of aircraft control, due either to turbulence or an in-flight fire, or both. Inability of the crew to establish timely radio communications with the departure controller was a factor, because it delayed compliance with thunderstorm avoidance vectors.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JOHN H. REED
Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ LOUIS M. THAYER
Member

/s/ WILLIAM R. HALEY
Member

Isabel A. Burgess, Member, was absent and did not participate in the adoption of this report

February 27, 1974

APPENDIX A

INVESTIGATION AND HEARING

1. Investigation

The National Transportation Safety Board was notified of the accident at 0550, on June 21, 1973, through the FAA Communication Center, Washington, D. C. Investigators from the Board's Washington office went to Miami, Florida, and began the investigation. An organizational meeting was held at the Miami Springs Villa at 1400, on June 21. Parties to the investigation were: The Federal Aviation Administration, Transair Cargo, Inc., U-Fly-It, Skyways International, Inc., and Warnaco, Inc. The Federal Bureau of Investigation assisted the Board in the early stages of the investigation. The field phase of the investigation continued until July 27, 1973.

2. Hearing

A public hearing was not held.

APPENDIX B

CREW INFORMATION

The flightcrew for this flight was supplied by Transair Cargo Service, Inc., as a contract service to the lessee.

Captain Ernesto J. Peyno

Captain Ernesto J. Peyno, aged 41, started to fly for Transair in January 1973. The captain held Airline Transport Pilot Certificate No. 1513753, with an aircraft multiengine land (AMEL) rating and commercial privileges in aircraft single-engine land (ASEL). He was type rated in DC-4, 6, and 7 aircraft. The captain had a first-class medical certificate dated February 19, 1973. The captain was required to wear glasses while exercising the privileges of airman. The captain's flight times are approximate and are based upon estimates extracted from Transair's records and interviews with personnel familiar with the captain and the remainder of the crew. The captain had 10,000 hours flight time, of which 3,000 hours were in DC-7 aircraft. The captain had not flown during the previous 24 hours.

Captain Ernesto Peyno was involved in an accident in Ponce, Puerto Rico. The accident was the result of material failure, and the captain was not cited for any violation. On another occasion, he received an FAA letter of reprimand for a violation of 14 CFR 61.3(e), flight without an instrument certificate.

Second-in-Command (Copilot) Robert E. Danz

Robert E. Danz, aged 31, was employed by Transair in January 1973. He held Commercial Pilot License No. 1813834 with ASEL, AMEL, and instrument ratings. The copilot had a first-class medical certificate dated May 30, 1972, with no limitations. The copilot's flight time was derived in the same manner as the captain's. He had 1,800 hours flight time, and his time in DC-7 aircraft was unknown.

The copilot's first-class medical certificate had been automatically downgraded to the equivalent of a third-class medical certificate on June 1, 1973, 20 days before the accident. The medical certificate in the possession of the copilot was good only for operations as a private pilot, because its 12-month validity as a first-class medical certificate had expired.

Flight Engineer Willie J. Gregg

Flight Engineer Willie J. Gregg, aged 42, was employed by Transair Cargo, Inc., in June 1973. The flight engineer held Commercial Pilot License No. 1400271 with ASEL, AMEL, and instrument ratings. He also held Flight Engineer Certificate No. 1413807 with a reciprocating engine rating. He had a second-class medical certificate dated December 8, 1972. His total flight time was 12,800 hours. The time in DC-7 aircraft was unknown, and was estimated in the same manner as that of the captain and the first officer. The flight engineer had not flown in the previous 24 hours. He had supervised the servicing of the aircraft at 1500 on June 20, 1973, before departing for his home to rest for the trip.

APPENDIX C

AIRCRAFT INFORMATION

Aircraft

Douglas DC-7C, Serial No. 45466, N296, was delivered to Northwest Orient Airlines on April 2, 1958. The original airworthiness certificate had been issued on March 26, 1958. The aircraft was registered to the Douglas Aircraft Company on September 16, 1960, to Riddle Airlines on July 18, 1961, to Airlift International on August 17, 1964, and to Skyways International, Inc., on July 30, 1972.

The aircraft was converted to a cargo configuration by the Douglas Aircraft Company on July 8, 1961.

Total aircraft flying time was 25,827 hours. The time since overhaul of the aircraft was 2,676 hours. The aircraft accumulated about 216 flight hours since its purchase by Skyways International, Inc. There were no records to indicate the exact number of flight hours.

The aircraft was maintained under 14 CFR 91.217(5). The inspection program had been approved by the FAA's SO-GAM-5, Miami, Florida, on December 19, 1972.

The aircraft received a numbered inspection on March 28, 1972. The aircraft's time since overhaul at the time of the last inspection was 2,617 hours. The next numbered inspection would have been due at 2,867 flight-hours after overhaul or July 28, 1973, whichever occurred first.

The powerplants on the aircraft were Wright Aeronautical Division, type 3350, Model 988TC18EA-1 turbocompound engines. The engines were equipped with Hamilton Standard, Model 34E60-355, propeller assemblies.

The aircraft received an annual inspection on August 7, 1972.

Aircraft Operational Data

The maximum gross takeoff weight for the aircraft was 143,000 pounds. The maximum zero fuel weight (maximum structural limit of the aircraft's adjusted operating weight plus cabin load) was 106,400 pounds.

The exact amount of gasoline aboard on takeoff was unknown. A fuel receipt showed that 2,203 gallons of 115/145 octane aviation gasoline and 60 gallons of oil were loaded aboard the aircraft before this flight. However, the amount of gas and oil that remained from the previous flight was unknown. It was estimated by a representative of Skyways, Inter-

national, Inc., that the upload of 2,203 gallons of gas would have brought the total fuel load for the flight to about 3,000 gallons.

The exact weight and distribution of the cargo could not be determined. Transair Cargo, Inc., which was responsible for loading the aircraft, had proceeded as follows:

The trucks which transported the cargo from the factory in Georgia to the aircraft were weighed at the Wildwood, Florida, weighing station; this weight was telephoned ahead to Transair. The empty weight of the trucks was subtracted from the gross weight. The resultant tare weight of the cargo, according to Transair, was 33,800 pounds. However, this figure was not documented.

The U. S. Customs' Shipping Export Declaration indicated that the load weighed 36,710 pounds. This figure was based on the weights stenciled on the parcels at the factory before shipment. A Warnaco representative stated that each individual carton or parcel is not weighed. Approximately 10 percent of the pieces are weighed, and identical parcels and cartons are stenciled with the same weights. The Warnaco representative added that the company had no reason to believe that the documented weight was any more accurate than the computer tare weight claimed by Transair.

The loadmaster at MIA stated that he had distributed the cargo weight evenly throughout the aircraft. The bulk of the cargo, consigned to La Romana, was loaded in the lower compartments. The remainder of the cargo, destined for San Juan, Puerto Rico, was loaded in the main cargo compartment. The cargo was held by a net that extended the entire length of the cargo compartment from the floor to the ceiling, which left an aisle about 3 feet wide along the left wall of the cargo compartment. The cargo included 428 rolls of textile material, which weighed about 42.7 pounds per roll, and numerous cardboard cartons and boxes containing undergarment accessories. The rolls were loaded in a fore and aft direction, and the piles were lashed down. The loadmaster stated, "We had about 50 or 55 rolls of material in each pile. We put some in front and some in the rear of the plane." The aircraft was bulk-loaded from front to rear. The load extended to within 3 feet of the ceiling of the cargo compartment. The loadmaster stated, "The load filled the entire aircraft."

The compartment weights were computed from the weights stenciled on the cartons and were entered on a sheet of paper. The loadmaster stated, "For this trip we had 33,800 pounds and I put the compartment breakdown and weight slip in the cockpit where I always put it for the captain or copilot."

According to Transair's procedures, the first officer usually computed the aircraft's weight and balance. Because the computation form

in this case was never found, the center of gravity of the aircraft at takeoff could not be determined exactly.

Two likely takeoff gross weights were computed by the Board, based on tare weights of 33,800 pounds and 36,710 pounds (manufacturer's supplied weight), a fuel load of 3,000 gallons, and an oil load of 224 gallons:

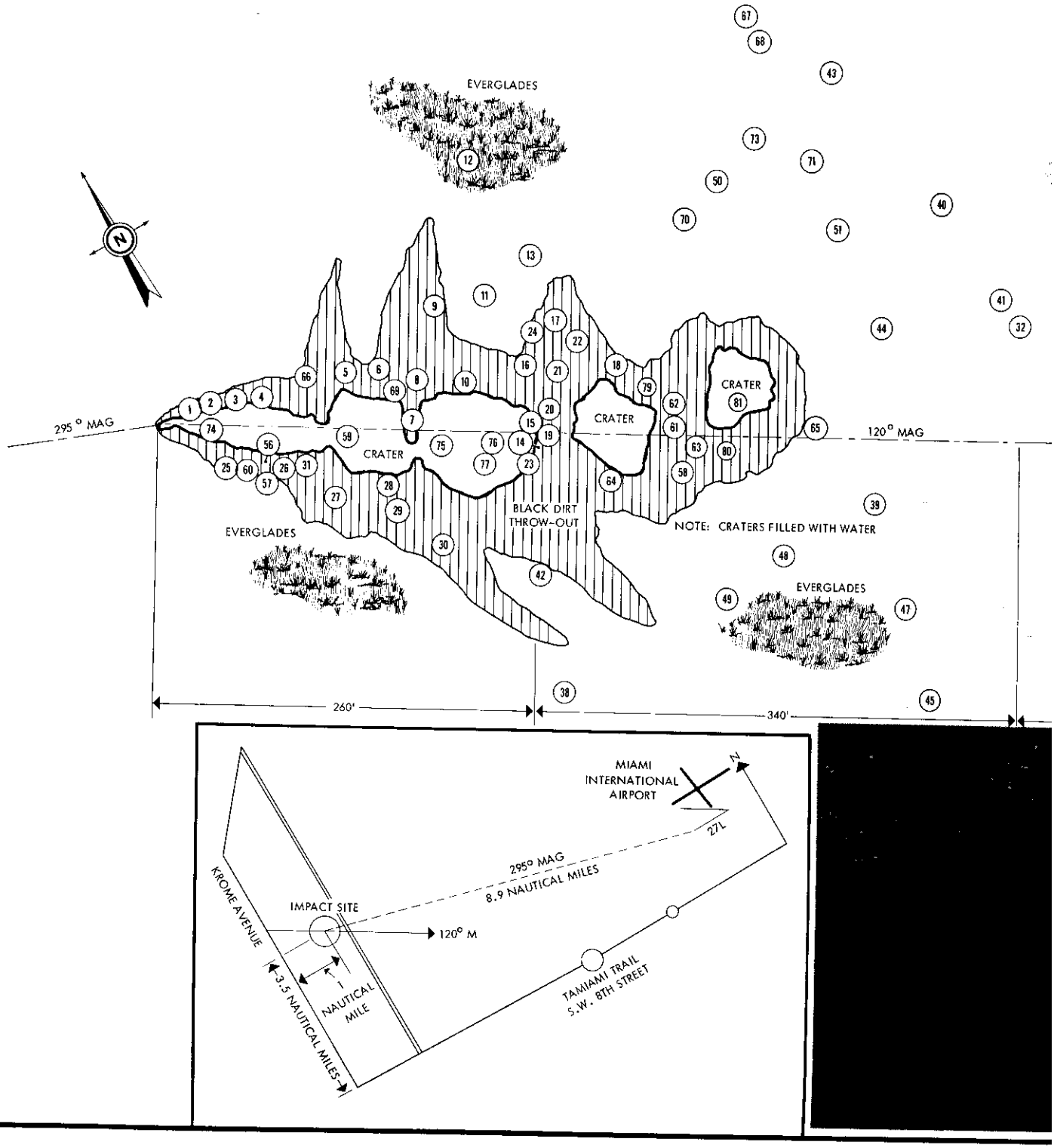
Aircraft Adjusted Operating Weight	71,655 lbs.	71,655 lbs.
Total Cabin Load	33,800 lbs. (Transair est.)	36,710 lbs.
Zero Fuel Weight	105,455 lbs.	108,365 lbs.
Nacelle Oil (224 gals. @ 7.4 lbs.)	1,680 lbs.	1,680 lbs.
Fuel (3,000 gals. @ 6.0 lbs.)	18,000 lbs.	18,000 lbs.
TOGW	125,135 lbs.	128,045 lbs.

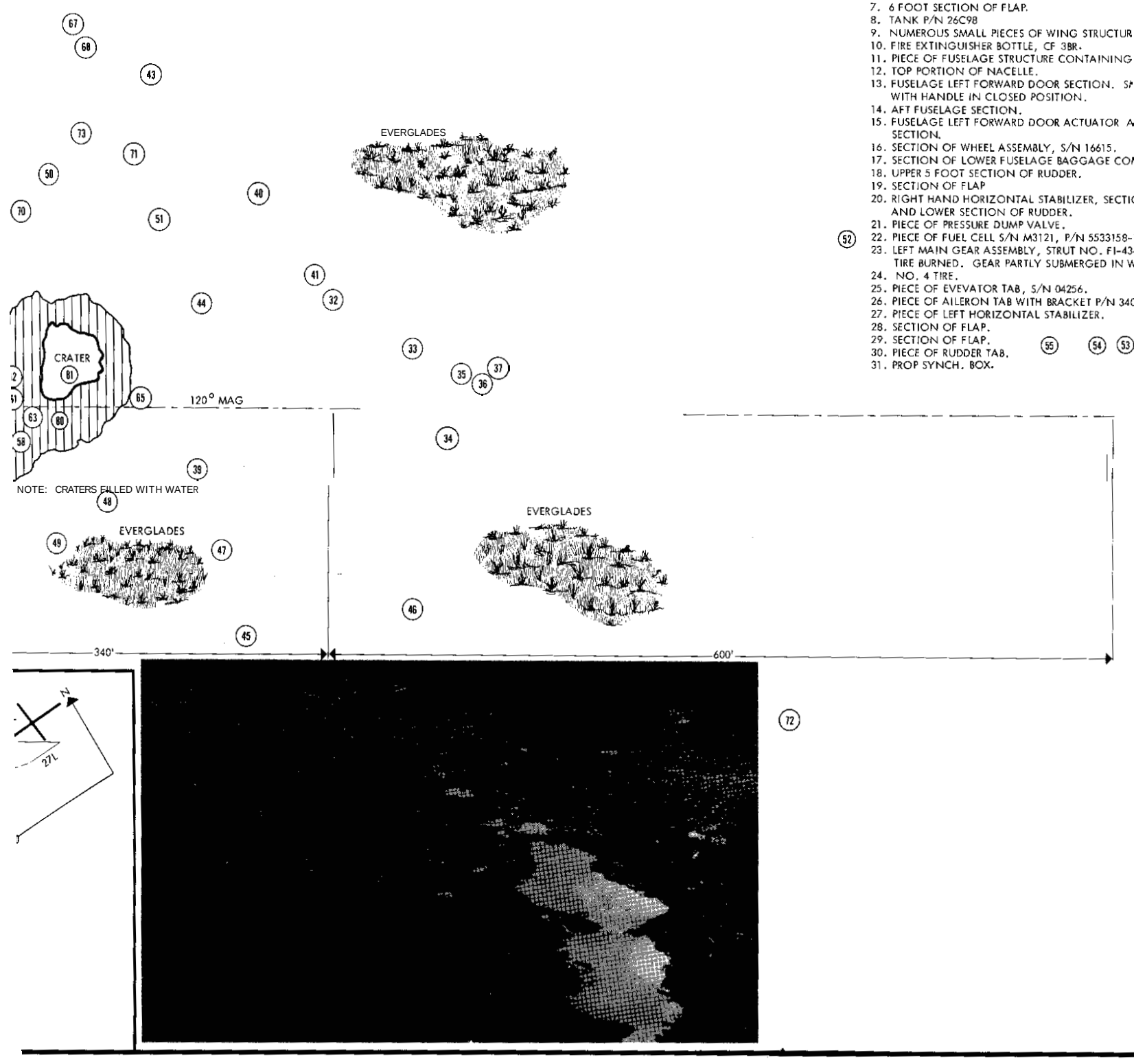
Aircraft Leasing

N296 was owned by Skyways International, Inc., a Georgia corporation. The aircraft was leased to Warners, a division of Warnaco, Inc., under the terms of an agreement executed on February 1, 1973. Pursuant to the terms of the lease, the lessor (Skyways) was to maintain the aircraft according to FA4 requirements and regulations. The lessee (Warnaco) intended to use an aircraft for one round trip every other week, but was not obligated to do so with any set frequency. The lessee agreed to obtain a properly certificated flightcrew from a reputable aircraft service company, which was acceptable to the lessor's and lessee's insurance carrier. The crewmembers were to be under the lessee's control. The lease agreement contained the "truth in leasing" provisions required by 14 CFR 91.54.

A service agreement between Transair (contractor) and the White Stag Manufacturing Company (customer), also a subsidiary of Warnaco, was agreed to on February 7, 1973. Pursuant to the terms of the agreement, the contractor furnished the customer with a properly maintained aircraft and all required documents aboard.

The contractor agreed to furnish flightcrews; however, it was understood that flightcrews would be under the operational control and direction of the customer.


EVERGLADES
CRATER
CRATER
CRATER
295° MAG
120° MAG
BLACK DIRT
THROW-OUT
NOTE: CRATERS FILLED WITH WATER
EVERGLADES
EVERGLADES
260'
340'
MIAMI
INTERNATIONAL
AIRPORT
N
27L
295° MAG
8.9 NAUTICAL MILES
IMPACT SITE
120° M
KROME AVENUE
1
NAUTICAL
MILE
3.5 NAUTICAL MILES
TAMIAMI TRAIL
S.W. 8TH STREET



1. INTEGRAL FUEL TANK ACCESS PLATE AND AD. (LEFT WING REAR OUTBOARD.)
2. LEFT AILERON TIP
3. 7 FOOT SECTION OF AILERON, LEFT WING.
4. LEFT AILERON CONTROL SECTOR, P/N 359785
5. PIECE OF LOWER WING STRUCTURE AND PIECE
6. PIECE OF ENGINE FIREWALL STRUCTURE AND A
7. 6 FOOT SECTION OF FLAP.
8. TANK P/N 26C98
9. NUMEROUS SMALL PIECES OF WING STRUCTUR
10. FIRE EXTINGUISHER BOTTLE, CF 3BR.
11. PIECE OF FUSELAGE STRUCTURE CONTAINING
12. TOP PORTION OF NACELLE.
13. FUSELAGE LEFT FORWARD DOOR SECTION. S/ WITH HANDLE IN CLOSED POSITION.
14. AFT FUSELAGE SECTION.
15. FUSELAGE LEFT FORWARD DOOR ACTUATOR A SECTION.
16. SECTION OF WHEEL ASSEMBLY, S/N 16615.
17. SECTION OF LOWER FUSELAGE BAGGAGE CO
18. UPPER 5 FOOT SECTION OF RUDDER.
19. SECTION OF FLAP
20. RIGHT HAND HORIZONTAL STABILIZER, SECTIO AND LOWER SECTION OF RUDDER.
21. PIECE OF PRESSURE DUMP VALVE.
22. PIECE OF FUEL CELL S/N M3121, P/N 5533158-
23. LEFT MAIN GEAR ASSEMBLY, STRUT NO. FI-43 TIRE BURNED. GEAR PARTLY SUBMERGED IN W
24. NO. 4 TIRE.
25. PIECE OF EVEVATOR TAB, S/N 04256.
26. PIECE OF AILERON TAB WITH BRACKET P/N 340
27. PIECE OF LEFT HORIZONTAL STABILIZER.
28. SECTION OF FLAP.
29. SECTION OF FLAP.
30. PIECE OF RUDDER TAB.
31. PROP SYNCH. BOX.

LEGEND

GRAL FUEL TANK ACCESS PLATE AND ADJACENT STRUCTURE
WING REAR OUTBOARD.)
AILERON TIP
OT SECTION OF AILERON, LEFT WING.
AILERON CONTROL SECTOR, P/N 3597850-3.
OF LOWER WING STRUCTURE AND PIECES OF RUBBER FUEL CELL.
OF ENGINE FIREWALL STRUCTURE AND ADJACENT NACELLE STRUCTURE
OT SECTION OF FLAP.
P/N 26C98
ROUS SMALL PIECES OF WING STRUCTURE.
EXTINGUISHER BOTTLE, CF 3BR.
OF FUSELAGE STRUCTURE CONTAINING ICE LIGHT.
PORTION OF NACELLE
AGE LEFT FORWARD DOOR SECTION. SMALL DOOR ATTACHED WITH
HANDLE IN CLOSED POSITION.
USELAGE SECTION.
LAGE LEFT FORWARD DOOR ACTUATOR AND TOP HORIZONTAL FRAME
ON.
ON OF WHEEL ASSEMBLY, S/N 16615
ON OF LOWER FUSELAGE BAGGAGE COMPARTMENT
R 5 FOOT SECTION OF RUDDER.
ON OF FLAP
1 HAND HORIZONTAL STABILIZER. SECTION OF AFT FUSELAGE
LOWER SECTION OF RUDDER.
OF PRESSURE DUMP VALVE.
OF FUEL CELL S/N M3121, P/N 5533158-1 L.H.
MAIN GEAR ASSEMBLY, STRUT NO. FI-4340, WHEEL NO. 263-6, NO. 3
BURNED. GEAR PARTLY SUBMERGED IN WATER.
4 TIRE.
OF EVEVATOR TAB, S/N 04256.
OF AILERON TAB WITH BRACKET P/N 340590-1. ALSO PIECE OF AILERON.
OF LEFT HORIZONTAL STABILIZER.
ON OF FLAP.
ON OF FLAP.
OF RUDDER TAB.
SYNCH. BOX.

(55) (54) (53) (78)

32. RIGHT MAIN GEAR ASSEMBLY AND PORTION Of NO. 3 NACELLE STRUCTURE.
33. NOSE GEAR DOOR, RIGHT HAND.
34. SECTION Of CONTROL COLUMN.
35. MIXING VALVE.
36. HEAT EXCHANGER.
37. COOLING TURBINE
38. FUEL VENT LINE
39. SECTION OF FIRE WALL AND OIL COOLER SCOOP.
40. SECTION OF LEFT COCKPIT STRUCTURE.
41. LOWER PORTION OF NECELLE STRUCTURE.
42. TAIL CONE
43. FLAP SECTION
44. SECTION OF RIGHT WING ALTERNATE FUELTANK. INTERNAL FUEL CELL CHARRED.
45. SECTION OF FUSELAGE SKIN.
46. SECTION OF FUSELAGE SKIN.
47. FLOOR STRUCTURE.
48. NUMEROUS PIECES OF FUSELAGE STRUCTURE,
49. NUMEROUS PIECES OF WING STRUCTURE.
50. NUMEROUS PIECES OF FUSELAGE STRUCTURE.
51. NUMEROUS PIECES OF WING STRUCTURE.
52. COCKPIT SECTION
53. NOSE GEAR ASSEMBLY
54. IMPACT MARK
55. IMPACT MARK
56. GEAR HOUSING AND PROP DOME.
57. 4 FOOT SECTION OF PROP BLADE.
58. PROP BLADE
59. GEAR HOUSING AND PROP DOME.
60. PROP BRUSH BLOCK ASSEMBLY.
61. ENGINEASSEMBLY. NO.1 ACCESSORY SECTION.
62. CYLINDER
63. MASTER FUEL CONTROL UNIT.
64. ENGINE ASSEMBLY, NO. 2 POWER SECTION.
65. ENGINE ASSEMBLY. NO. 3 POWER SECTION.
66. PROPASSEMBLY
67. PROP BLADE
68. PROP BLADE
69. SECTION OF LEFT WING ALTERNATE FUELTANK. INTERNAL FUEL CELL CHARRED.
70. SECTION OF INTEGRAL FUEL TANK WITH LIQUIDOMETER Will. INTERIOR PORTION OF TANK SECTION SHOWED EVIDENCE OF BLACK SOOT IN AREA OF LIQUIDOMETER PROBE
71. VERTICAL SECTION OR RIB OF INTEGRAL FUFI TANK SHOWING EVIDENCE OF SOOT EMINATING FROM PIPE HOLE.
72. FUSELAGE SKIN
73. RIGHT WING TIP.
74. FRAGMENTED PIECES OF INTEGRAL FUEL TANK OUTBOARD WING PANEI FIRE DAMAGED.
75. PIECES OF CENTER WING STRUCTURE
76. PIECES OF FUSELAGE STRUCTUREAND ROLLS Of CLOTH.
77. PROPELLER BLADE (2)
78. PROPELLER BLADE
79. ENGINE ASSEMBLY, NO. 4 POWER AND ACCESSORY SECTION.
80. ENGINE ASSEMBLY, NO. I POWER AND ACCESSORY SECTION.
81. ENGINE ASSEMBLY, NO. 2 ACCESSORY SECTION.

NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D.C.

WRECKAGE DISTRIBUTION CHART
SKYWAYS INTERNATIONAL, INC., DC-7C
N296, SIN 45466
NEAR MIAMI, FLORIDA

JUNE 21, 1973

APPENDIX D